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5P43 - Dynamics of Melting Solenoids for Laser Experiments on the National Ignition Facility

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A new pulse power system has been developed to investigate the use of "exploding" solenoids for establishing large magnetic fields for laser-driven inertial confinement fusion experiments. A 40 kV, 4 μF capacitor, switched by spark-gap drives up to 30 kA in small solenoids inside a vacuum chamber, establishing peak axial magnetic field strengths of 30 T in approximately a 1 cm^3 volume. The solenoids are specifically designed to reach melt temperature just after the peak magnetic field has been established allowing the solenoids to rapidly disassemble into fine debris, thus mitigating potential risk for optics damage. Diagnostics used for the experiments include a 10 MHz video camera, current and voltage probes, high-density B-dot probes (magnetic field probes), two-color pyrometry and an Aerogel debris catcher. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

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